Geometric Roots of the Anticipatory Procedures

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Abstract
This communication shows the dependence between the forecasting waves and their propagation spaces. Indeed the points are the space molecules and consequently radiate waves throughout their whole space according to "de Broglie" relation.
To develop this particularly scheme we introduce generalized futures under vector compositions, the echoic horizons, the moving operators (**Z.O.**), the travelling waves and the topic flows. The pulsating points show space structures as in a telescope ocular. An operational comparison is developed between the recurrence algorithms applied to points and the scanning of the future states. The stabilizing function of echoes over the evolutions is underlined.
For illustrating a permanent stationary future in technology, we scan the conversion of power in an electrical machine where a pair of rotating electromagnetic waves, performs a progressive procedure for maintaining the functional stability.

Keywords: Generalized future, Smooth and corrugated spaces, Moving operators, Recurrence procedures, Pulsating points and waves

1 Introduction

What are the space compositions? According to the most general definition: any space is composed of a very large amount of points. From this consideration, the second question will be: what are the points? Here, the answer is not absolutely obvious because each point may be composed of a constellation of other sub points supporting various ground properties. This point decomposition could be conducted further and further according the needs of each study. Indeed each point in a uniform space carries the miniaturization of its space structure and consequently plays as telescope ocular.
To perform these functions we must use pulsating points which during their expansion phases detect and collect the structures of their whole spaces.
On the other side, the vectors allow to evaluate the locations of any object into its space. These vectors are also able to represent the directed distances between pairs of points. After a short analysis it appears that a tight relation has to link points and vectors. This similarity is particularly strong when we consider the point powers and products in comparison with the tensor powers and products. An additional element is the **Z** operator (= **ZO**) which gives mobility to points and vectors. Consequently the (**ZO**) transform the points and vectors into travelling waves what introduces the kinetic behaviour, very useful for performing the anticipatory algorithms. The movement studies bring in this work the main characteristic useful to illustrate the various

evolutions. To make easier the control of the evolutions, we quantify the future by the introduction of the echoic horizons and we will bind time and locations due to the introduction of the working time of the operators. The three objects, here defined: points, vectors and **(ZO)** appear as useful tools for developing the anticipatory structures. Consequently this communication will show that the space properties will be helpful for the dynamical developments to the future.

2 Spaces and Point Dynamics

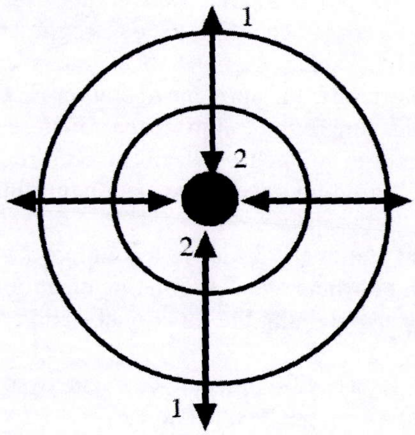


Fig. 1 : Pulsating Point : **1**: Expansion Phase; **2**: Contraction Phase

Because the spaces very oft are huge domains without accurate borders and consequently composed of large continuum of innumerable points, it seems logical to introduce the pulsating point for collecting and synthesizing the space characteristics. Indeed a pulsating point plays various roles: its first function is the alternative sweeping of its space from an arbitrary chosen centre to the infinite shell: this is the exploration during expansion phase followed by the structure elaboration during contraction phase.
On the other side the pulsating point could also be considered as a space producer similar to the cosmic "Big-Bang" which made expanse our universe and afterward as a space absorber similar to a mega shrinkage caused by a hard frost to the surrounding of O°K or by the absorption in the neighbourhood of a black Hole (Fig. 1).
This point working could be compared with a homothetic operator whose ratio would alternatively vary from e (very short radius) to the infinite space shell. This pulsating point acts as a geometric fixed wave with an arbitrary working frequency according to the operator wish. This pulsating point appears as a well suited space ocular where it is possible to detect with comfort and accuracy, every specificity of the internal topology.

3 Points and Waves

A point acts as a space molecule or a very small particle therefore it can receive or supply waves according to Planck's relation (1) in association with de Broglie's one (2) [1]:

$$E = h f \qquad (1)$$

where E is the wave energy [J.], h is the Planck constant = 6.6 10^{-34} [J. S.]
f the wave frequency [Hz.]

$$l = h/(mc) \qquad (2)$$

where: l is the wave length[nm] thus a wave parameter; mc is the mechanical impulsion [gr m/s] thus a particle parameter.
Relations (1-2) point out that a particle located on a point is equivalent to a wave
Consequently any point may be considered as a wave generator and shall be assimilated to its wave whose frequency is related to the kind of the space matter. This oscillating mechanism shall produce a corrugated space, with a specific wave transmittance which is given by the matter vibration. This wave frequency produced by material particles are designed as nominal frequency of space. From this frequency perspective each space supports the evolutions and operations working at the same frequency.
These spaces are loaded by a potential energy identical to the internal matter energy.
These pulsating points may be incorporated in the generalised behaviour of everybody located in our universe where each element is pulsating. These oscillating objects are functioning on each dimensional scale. Indeed the infra objects as atoms, molecules, produce vibrations at their specific frequencies. On the other side, in the rocks, each crystalline structure is also vibrating. The heart beatings in each living being are also giving pulsations which indicate its living state. On the cosmic scale there are also oscillating objects such stars, pulsars and quasars. This short survey of the vibration spread shows their universal integration.
It is also obvious that these vibrating objects act as resonators and consequently produce travelling waves what oft prove their existence. Internal vibrations and emitted waves have the same frequencies because waves are caused by these vibrations.
To prove these relations between the vibrating bodies and the waves, we remind the Fourier Analysis which gives the frequencies of time signals. This proofs the functional links between waves and their resonators. Indeed this analysis explains the chemical architectures which play as wave generators .
These wave observations allow very deep penetrations of the cosmos and consequently detect unknown vibrating distant bodies.

Fourier Transformation : $$S(f) \leftarrow \int_B s(t) \exp(-jwt)\, dt \qquad (3)$$

Where w =2pf pulsation of resonator, S(f) : the spectral density corresponding to s(t) the time signal, and B is the period of s(t).

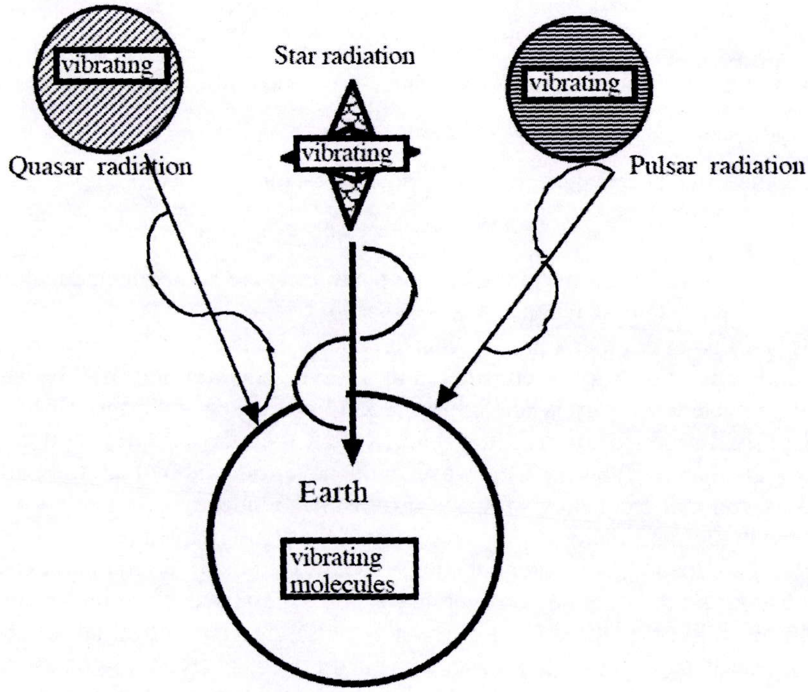


Fig. 2: Synthetic Presentation of our pulsating Universe

4 Point Structures

A point which synthesizes a space may be composed in turn of reunion of other internal sub points. These point components act as a vector exploration. It plays as a multi stage insertion of sub particles what corresponds to the material structures of our universe. Indeed a point may content a few various objects which are hidden in its space.

Table 1: Synoptic Functions of pulsating Point

Detection orientations	External	Internal
Actions	Space contraction	Sub particle amplification
Math. Descriptions	$Log_{10}[\Delta_{obj}]$	$Log_{(1/10)}[\delta_{obj}]$
Optic devices	Telescope	Microscope
Explorations	Supra	Infra
Waves	Travelling	Inscribed mobility
Information	Macro	Micro
Similar sciences	Astronomy	Geology
Knowledge acquisitions	Synthesis	Analysis

A point exerts 2 detection tasks :

a) An external observation to miniaturize with accuracy its whole space: this is the telescope function or supra exploration.
b) An internal detection to amplify the sub points and to give a picture of its internal configuration; this is the microscopic function.

Consequently a pulsating point performs a double exploration, with 2 sight levels whose working functions could be assimilated to logarithmic transformations:

$Log_{10}[\Delta_{object}]$ for performing the supra explorations what reduces the mega distances. The basis has to be > 1

$Log_{(1/10)}[\delta_{object}]$ for performing the infra exploration; what zooms the micro objects. The basis has to be <1. This is similar to the (Ph) = [H^+concentration] function in chemistry.

We remark that a point may deliver a very large and deep operational description of the properties of its space, what is a behaviour similar to this one of the ancient god "Janus"

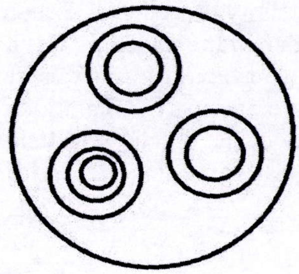


Fig.3: Point and internal Sub points

5 Characteristics of Spaces

Dimensions: number of independent parameters which define the objects located in their space. It is also the number of vectors required to form any basis in this space and consequently the number of vector components.

Frequency: each matter has its own frequency related to its material composition and its shape. Consequently there is an automatic frequency transfer from the matter to its space support.

Transmittance: expresses the easiness of wave penetration, is equivalent to a space admittance for the waves. This is noticed on the following way:

$$\text{Tansmittance} = Y_{tr} = 1/Z_{tr} \qquad [S] \tag{4}$$

where Y_{tr} is the penetration admittance , Z_{tr} is the penetration impedance

$$Z_{tr} = (R + jX)_{tr} \qquad [W] \tag{5}$$

where R_{tr} is the energy dissipative component, X_{tr} is the reactive component related to the storage ability of potential energy.

For practical reasons we will use these penetration characteristics related to the unitary space (hyper) volume; what will be noted: ${}^{u}Y_{tr}$ or ${}^{u}Z_{tr} = {}^{u}(R + JX)_{tr}$ as unitary characteristics.

The Xtr component reacts with the travelling waves and can modify the energy potential of its space. The present energy level of a space results from the occurrence of the previous events.

Propagation velocity: indicates the travelling wave velocity what is a ballistic or kinetic parameter. Consequently, the considered spaces here must usually content a time component.

Propagation trajectories: in these kinetic spaces, each curve has to be considered as a potential wave trajectory. Indeed the mobility is intrinsically integrated in our propagating spaces.

Echoic Horizon: partition line for any trajectory where space discontinuities or particular event occur. These echoes are produced by these propagation singularities and play as feedback agents carrying information from the future to our present situation, what is also efficient in the incursivity procedures. Echoic horizon is a vibrating border with the same frequency as this one of the travelling wave. (fig;4)

Space Curvature: points out the density of interaction between waves and propagating spaces. It always shows that there are energy migrations between every mobile object and its trajectory. This parameter is crucial for this communication because the anticipation procedures will appear as gliding waves from a horizon to the following one.

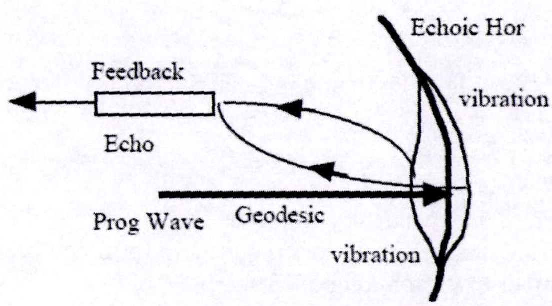


Fig. 4: Effect of an echoic Horizon on a travelling Wave

Geodesics: they are wave trajectories because waves always glide along the shortest ways between their successive horizons and in our kinetic spaces these geodesics are necessarily also brachistochronous curves what are run in the shortest time by the waves. The geodesics are everywhere tangent to **grad**(U) and consequently orthogonal to each horizon because geodesics may be assimilated to vector action lines and horizons to levels of constant potential.(Figs.4-5)

Grad(potential) = Grad(U): vector oriented along the largest variation of the stored potential (U) whose amplitude is equivalent to this largest local potential variation.

Table 2 : Geodesic Characteristics

Characteristics	Values
Arc length	Minimum
Run time	Minimum → (Brachystochrone)
Velocity	Maximum
Transmittance	Maximum
$[Ztr = (R + \mathbf{j}X)tr]_{geod}$	Minimum
Energy loss or exchanged	Minimum
Orientation	**-grad**(U)

6 Forms of pulsating Points related to the Space Topology

According to the domain shape and the anisotropic grade, the pulsating points win an adapted morphology. Indeed in an isotropic space without any exclusion sub domain, the circle, or sphere or hyper sphere are the best forms in relation to the dimensions.
When there are anisotropic axes, the ellipse, or the ellipsoid or hyper ellipsoid are the most suited forms of points, in relation to the dimensions.
Why is it advantageous to modify the point profiles? This seems well indicated because any point is a space miniaturization what involves that points must carry all the space properties related to the operational structures and to the shapes. [7 & 8]

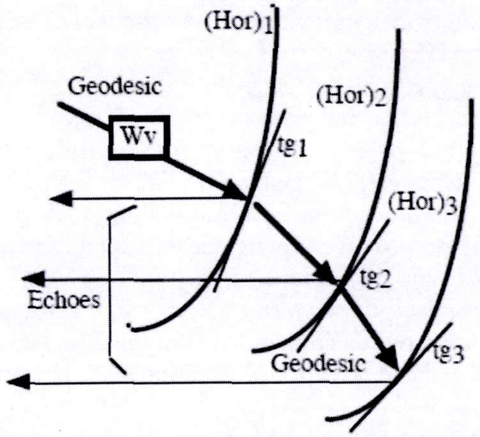


Fig.5: Presentation of Geodesics and echoing Horizons

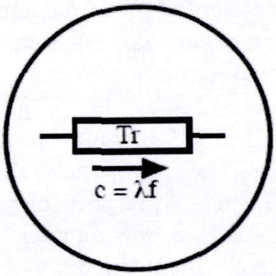


Fig. 6: SpaceTransmittance Characteristics of a Wave

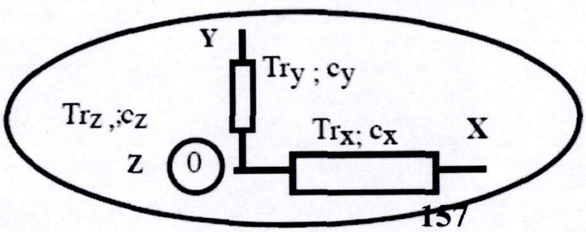


Fig.7:Anisotopic Space

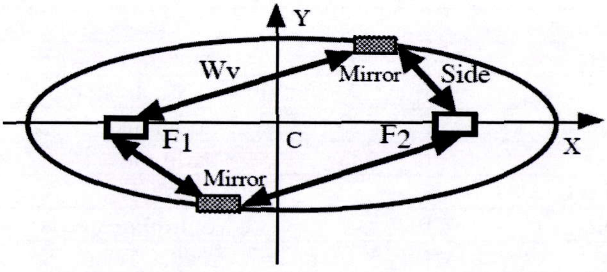


Fig.8: Elliptic Space with its focal Pair

Table 1 indicates a few associations between the main spaces and their illustrating points.

Hereafter follow short descriptions of forms and behaviours of the given points.

a- Spheres and circles are the most isotropic forms, therefore their pulsating configurations are explorers of isotropic homogeneous spaces.

b- Ellipsoids and ellipses have anisotropic axes, used for exploring the anisotropic spaces. (Figs. 6-7)

c- Paraboloids and parabolas play similar roles as the ellipses (and ellipsoids) because they are obtained by a homeomorphic deformation of ellipses. In these last figures appear pairs of foci located on each anisotropic axis. Inside each pair of conjugated foci there is always wave trajectories composed of 2 straight sections divided by a side reflection.(Figs. 8-9)

d- Astroids and pairs of conjugated hyperbolas are also derived forms related by homeomorphic deformation. (Figs.11-12) Indeed astroid is a curved square inscribed in a circle of radius R which plays as trajectory for an inside rotating circle of radius $r = R/4$. This is a hypocycloidal generation. When the apices of the astroid are drawn away more and more from each other along their axes to approach the infinite zone it seems to produce a pair of conjugated hyperbolas (conjugated hyperbolas have the same asymptotes).It is to notice that each hyperbola branch is an alternative trajectory between an asymptotic zero and an asymptotic pole which may be considered as conjugated components. A pair of conjugated asymptotes is a set of 4 trajectories for connecting each asymptotic zero to its conjugated pole. (Fig. 12). [7]

Parabolic and hyperbolic morphologies are inserted in spaces oriented to the very far regions.

e- Vertices or whirling points are used to describe the mosaic spaces which are fractioned in a set of useful grains supporting circular waves circled by insulating joints. This morphology is adapted to follow the curling fields what occurs in the superconductive ceramics. (Fig:13) [2]

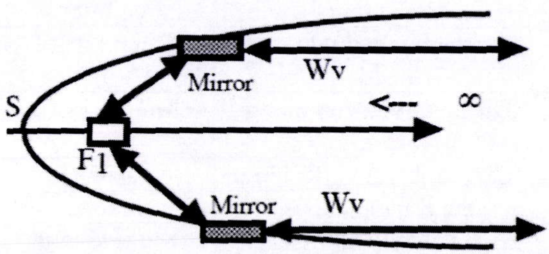


Fig. 9: Parabolic Space with a Focus at finite Distance and the other in infinite Location

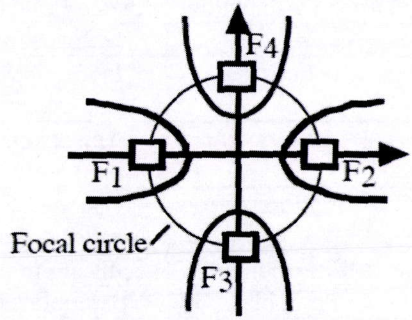


Fig. 10: Multi parabolic Space

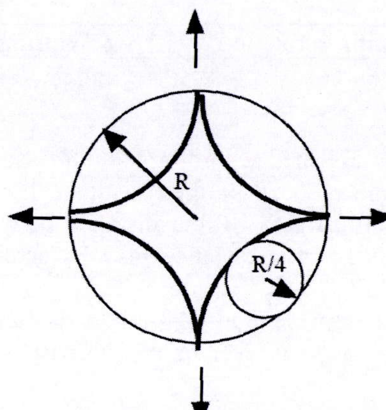


Fig.11: Astroidic Space

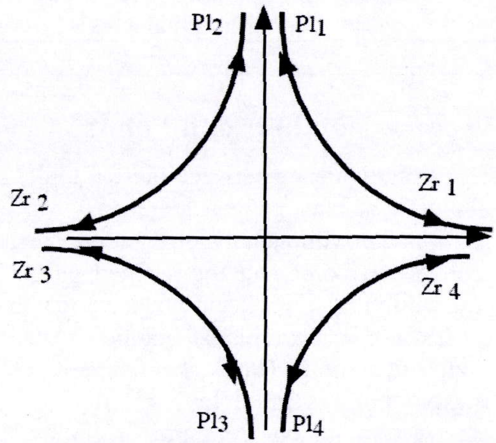


Fig. 12: Pair of conjugated Hyperbolae

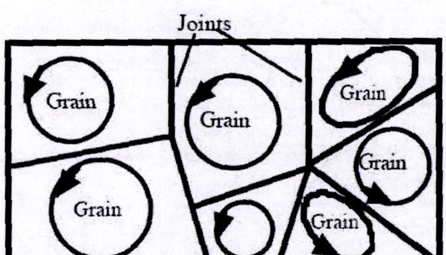


Fig. 13: Mosaic Structure [2]

Table 3 Adaptation between Points and Spaces

Points	Spaces	Behaviours	Evolutions
Spherical	Isotropic & homogeneous	Constant velocity in each direction	Mono kinetic
Elliptic	Anisotropic	Different velocity along each axis	Multi Kinetic
Parabolic	Space of parabolic shade	Very high velocity along the principal axis	Quasi mono kinetic
Multi oriented Parabola	Splitting in this parabola set	High velocity along each axis	Multi kinetic
Astroidic	Hollow curved square	Four principal directions	Tetra kinetic
Pair of conjugated hyperbolas	Infinite drawing along four orthogonal axes	Four asymptotic directions	Tetra kinetic
Vertices	Mosaic structure	Grains in rotation	Whirling

7 Vectors, Numbers and Points

Here, the equivalence between these 3 topics is established according to number kinds:
Real numbers may be considered as axial numbers because they evaluate levels or scalar values, without any orientation, what is illustrated by the distance between a chosen origin point and the defined point. This specific distance may be actually a vector with the same orientation as the real axis.
Complex numbers are planar numbers because they present an amplitude, as modulus, and an orientation. These characteristics are also planar vector characteristics. The illustrating point is the vector extremity.
These vectors issued from the origin by their extremity locate the points and are considered as external ones in relation to the point.
Besides, there are internal vectors inside the points specific to vector spaces, where the referential is constituted by n independent basic vectors if it is inserted in a space with n dimensions. (Fig. 14)

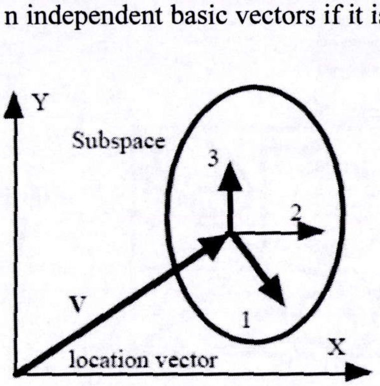


Fig. 14: Location Vector (**V**) for Point and detection of internal Vectors [**1,2,3**]

Table 4: Complex Characteristics

Complex Number	$Z = Re + \mathbf{j}\ Im$
Modulus or Amplitude	$\rho = (Re^2 + Im^2)^{1/2}$
Orientation	$\theta = artg(Im/Re)$

8 Generalized Future

Indeed Any transformation or operation is time consuming when an operator modifies its data to obtain the results, it needs some duration what is designated as working time. This means that any operation produces a state change always related to a time variation. Therefore any movement between 2 points always involves an implicit future penetration. Consequently it is impossible to dissociate time from dynamic spaces where actions are performed. Any horizon is a geometric curve with always time and space components. (Fig.16).

9 Movement Operator or (ZO) Operator

The most basic operator is the movement transmission to an object what is performed by the (**ZO**) application. This (**ZO**) gives mobility to any static element. This is the necessary operator to describe every dynamic operation.

$(\mathbf{ZO_k})^p$ is a point displacement or a sliding vector because both topics have the same characteristics:

Subscript (k) points out the orientation along a specific trajectory; superscript (p) is the movement amplitude along this trajectory.

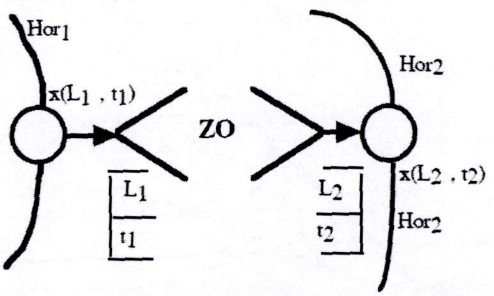


Fig . 15 : Convolution of (x) through the Space [L, t] between $(Hor)_1$ and $(Hor)_2$

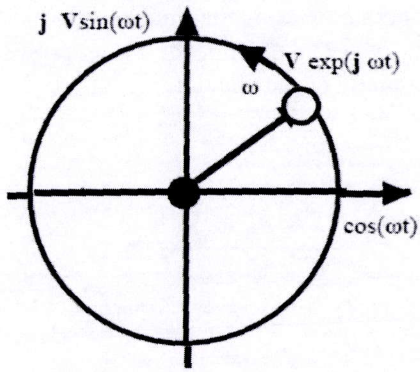


Fig.16: Rotation of a complex Vector on its Phasor

Table 5: Movements given to a Complex Number

	Cartesian form	Polar form	Point
Fixed complex number	$Z_0 = \mathrm{Re} + \mathbf{j}\ \mathrm{Im}$	$Z_0 = \rho \exp(\mathbf{j}\ \theta)$	P_0
$(\mathbf{ZO}_{\mathrm{Re}})^3[Z_0]$	$Z_1 = 4\mathrm{Re} + \mathbf{j}\mathrm{Im}$		P_1 = horizontal translation of P_0
$(\mathbf{ZO}_{\mathrm{Im}})^2[Z_0]$	$Z_2 = \mathrm{Re} + \mathbf{j}(3\ \mathrm{Im})$		P_2 = vertical translation of P_0
$(\mathbf{ZO}_\rho)^2[Z_0]$		$Z_3 = 3\ \rho \exp(\mathbf{j}\theta)$	P_3 = radial Translation of P_0
$(\mathbf{ZO}_\theta)^4[Z_0]$		$Z_4 = \rho \exp(\mathbf{j}5\theta)$	P_4= angular translation of P_0
$(\mathbf{ZO}\rho)^n\ (\mathbf{ZO}_\theta)^m\ [Z_0]$		$Z_{mn} = (1+n\rho) \exp[\mathbf{j}(1+m\theta)]$	P_{mn} = radial and angular translations of P_0

(**ZO**) moves the location of the point Z_0 or the extremity of its linked vector therefore Table 5 points out the new numbers formed by the new locations of the moving points. (Figs.16-17-18).

Use of (**ZO**): it acts as a locomotive for a lot of operators which perform transformations involving a displacement of their data.

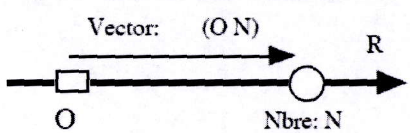
Rotations and (**ZO**) operator: from the fact that the complex notation are suited to describe any angular variation, it is obvious that the imaginary unit which displays a rotation of $(\pi/2)$ may be considered as $(\mathbf{j}) = (\mathbf{ZO}_\theta)^{\pi/2} = \exp(\mathbf{j}\ \pi/2)$ (6)

Consequently any power of the imaginary unit $(\mathbf{j})^p$ is an angular (**ZO**) operator and this is equivalent to $\exp[(\mathbf{j}\ p\ (\pi/2)]$.

Euler's relation observed under the (**ZO**) sight proves the link between the pulsating points and the curl. operator :

$$(\mathbf{ZO}_\theta)^{\omega t} = \exp(j\omega t) = \cos(\omega t) + \mathbf{j}\sin(\omega t)\ \&\ \theta = \omega t \quad (7)$$

Where $\cos(\omega t)$ is real pulsating projection and $\sin(\omega t)$ is imaginary pulsating projection of the $(\mathbf{ZO}_\theta)^{\omega t}$ Indeed, these projections act as axial pulsating points, along axes mutually perpendicular.



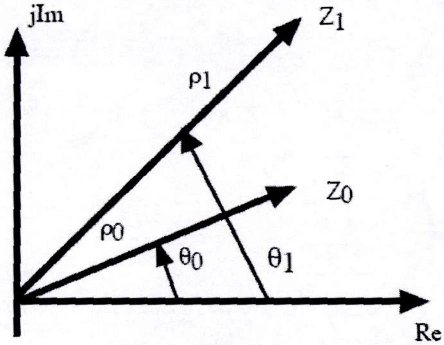


Fig.17: Real number and its Vector Position **Fig.18**: Illustration of the Operation $\mathbf{ZO}_\rho)^n\ (\mathbf{ZO}_\theta)^m\ [Z_0] = \mathbf{Z}_{mn} = \mathbf{Z}_1$

10 Transfer Operators (Tr.O)

These (**Tr.O**) are used for the migrations of mathematic functions between a pair of spaces. For instance these transfers are necessary to perform Fourier and Laplace Transformations whose selected notations are here noticed:

$$^{(t}(\mathbf{ZO})_{f)}[s_t] \rightarrow S_f \qquad (8)$$

where (s_t) is a time signal , S_f is its picture on the frequency spectrum
On the other side the Laplace Transformation is written:

$$^{(t}(\mathbf{ZO})_{\sigma+j\omega)}[s_t] \rightarrow S_{\sigma+j\omega} \qquad (9)$$

Where σ is the exponent of damping or of amplification of s_t, ω the angular frequency of s_t. These transformations are signal migrations from the time space to the frequency space , for Fourier and from the time space to the damping or increasing evolution space for Laplace. Consequently it is easy to remark that the (**Tr.O**) involve a tight operational similitude with the already defined (**ZO**). The use of (**ZO**) is very frequent because it is included in a lot of more developed operators where a displacement or a transition is implicitly performed. These various mobile components are oft necessary to assume a correct working of many operators what is the case for the convolution operators.

11 Convolution Operators

They transform their entry flow for elaborating the produced one and they simultaneously control the positions of the data and the results. Convolution always involves flow displacement between 2 states or 2 locations. It plays as master key in the working structure of each operator set because the dynamic trend belongs to many convertors. In our motors and generators the energy flows transmigrate from a domain to another and simultaneously undergo the necessary adaptations. Indeed the convolutions support and propel our technical progresses. They involve our displacements and communications. They support any evolution and transition. They can describe travelling waves and consequently they play as kinetic detectors for understanding all the dynamic procedures.

Table 6: Convolution Types and Performances

Denominations	Initial location	Arrival location
$(\mathbf{ZO}_k)^p$	Starting k value	Final k value
Wave	Source	Receiver or sink
Line integral	Initial point on curve	Stop point on curve
Electric motor	Electric net Electric energy	Transmission shaft Mechanical energy
Alternator	Transmission shaft Mechanical energy	Electric net Electric energy
Pomp	Water at low level	Water at high level
Steam turbine	Steam at high pressure and high temperature	Steam at low pressure Mechanical power on shaft
Evolutions	Initial state	Present or future state

We can remark that $(\mathbf{ZO}_k)^p$ may be considered as an elementary convolution operator because it only generates movement.
Here is proved the equivalence between travelling waves and $(\mathbf{ZO}_k)^p$ and their common characteristics which include both in the convolution set.

12 Space Types

In this study we have to consider 2 different space structures: smooth ones and corrugated ones.
Smooth space presentation: these are pure geometric and kinetic spaces similar to paper pages. They support reasoning progressions and recurrence procedures what are theoretic evolutions. They don't carry energy density without attenuation nor braking.
Corrugated space presentation: they are the propagation spaces for sound and electromagnetic waves. They carry potential energy therefore they vibrate with a specific frequency which is the same as the one of their travelling waves. Here there are energy exchange with their crossing objects which are braked because a dynamic resonance. They are oscillating spaces.

13 Wave Propagation through its Space

Any electromagnetic wave may be described as an energy flow whose a fraction is absorbed by means of an inductive coupling between this wave and the space inductive transmittance.(Fig. 19). The wave speed causes the frequency of the electric current induced in the space impedance what produces a dissipated energy in R_{Tr} and a storage potential in X_{Tr} Any travelling wave creates with its space a type of inductive linear motor where the inductor is the gliding wave and the induced component is the fixed space. This furtive device decreases the wave energy to inject additional energy in the space impedance and impresses the space frequency. This explains the mutual influence between moving object and space.

Table 7: Comparison between Smooth and Corrugated Spaces.

Specificities	Smooth space	Corrugated space
Frequency	$f_{rs} = 0$	$f_{rs} = f_{wv}$
Potential energy: U_s	$U_s = 0$	Us = storage energy
Horizons	Without any echo	Echoic ones
Entropy: S_s	$S_s = 0$	$S_s > 0$
Behaviour	Passive	Inter action with moving objects
Propagations	Recurrences	Anticipations
Waves	Deterministic	Random
Resonator	Zero	Effective
Impedance: Z_{tr}	$Z_{tr} = 0$	$Z_{tr} = (R + jX)_{tr}$

14 Recurrence Procedures

They are mathematical evolutions and chains of repetitive assertions, keeping the same accuracy at each step of their progression according to the elaborated algorithm. From simple relations between a few start states a reasoning is deduced and afterwards it will be drawn to the further horizons in a smooth space without any external disturbance.

Recurrences work along regular progressive trajectories (operational geodesics), consequently they are isentropic algorithms. They may be considered as axial adaptations and transfers of near relations to the infinite shell of their space what is similar to travelling waves. They also carry the convolution characteristics because they transit between successive static horizons.

Table 8: Types of Recurrences

Designations	Performances	Propagations
Iterative addition or arithmetic progression	$S_{n+1} \leftarrow S_n + a_{n+1}$	Along the sub scripts
Iterative multiplication or geometric progression	$P_{n+1} \leftarrow P_n\, b_n$	Along the sub scripts
Pascal triangle	$C^k_{n+1} \leftarrow C^k_n + C^{k-1}_n$	Along super scripts & sub scripts
Newton binomial	$^*(x+y)^{n+1} \leftarrow (x+y)^n\,(x+y)$	Along the exponents
Leibnitz	$^{**}D_x(g_x.\,h_x)^n \leftarrow D^{n-1}_x(g_x.h_x)\,D_x(g_x.h_x)$	Along the exponents
Successive applications of an operator (G)	$X_{out} \leftarrow X_{in}\,(1+G+G^2+G^3+G^4+G^5+\ldots)$	Along iterated loop
Differential relation	$D^n \leftarrow a_{n-1}D^{n-1} + b_{n-2}D^{n-2}$	Along exponents & sub scripts
Extrapolation	$S_{x+1} \leftarrow aS_x + b\,S_{x-1} + cS_{x-2}$	Along the (x) axis
Mountain plan	Element assembly	Along the task sequence
Work Preparation	To collect Tools and Materials	Follow the step sequence
Reasoning	Logical connection of necessary proposals	To progress along idea chain
***Spectroscopy	Detection of molecule architectures	Wave penetration through matter

Notation explanation: S: Summation P: Product

D_x: Derivative acting on the variable x D^p_x derivative of p grade acting on x

g_x , h_x functions of x

Development of the star expressions $^*(x+y)^{n+1} = \Sigma_k\, C^k_n\, x^k\, y^{(n+1)-k}$

** $D^n_x[g(x)\,h(x)] = \Sigma_k\, D^k_x[g(x)]\, D^{n-k}_x[h(x)]$

*** Spectroscopy is an accurate introspection inside molecules, by means of electromagnetic waves of frequencies located in the (Infra Red) or in the (Visible) or in the (Ultra Violet). These procedures, through vibrating matter, are isentropic.

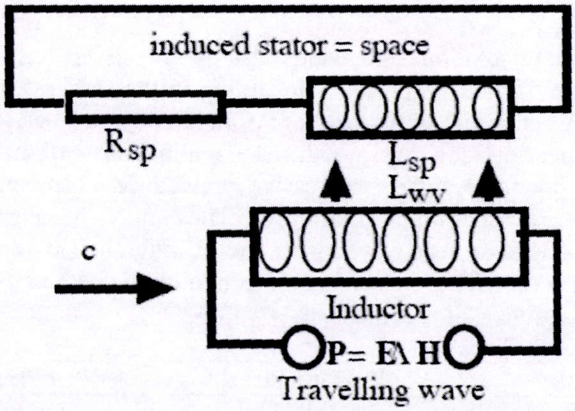


Fig. 19: Energy Flows between a travelling Wave and its propagation Space

15 Anticipatory Procedures

Their objectives are the determinations of system evolutions through the future. Here the systems work through physical-chemical spaces which are corrugated consequently loaded with potential energy. Therefore the propagation spaces may inter act with the expansions of the anticipatory procedures.

Table 9: Anticipation Types

Designations	Structures	Horizons or Effects
Weather Forecast	Sometimes uncertain	daily
Climate evolution	Very entropic	century
Geologic evolution	Very slow but quasi certain	Thousand years
Volcano activities	Weak accuracy	A few years
Protection of the Environment	Many actors to convince Neguentropic progress	A few years
Protection of very rare species	Difficult to let apply Very slow progress	A few decades
Breakdown forecast	Limited reliability	Operational time
Market management	Convergence between producers and purchasers	Production improvement
Company Policy	Adaptation of the staff to the machines	Benefit maximisation
Government formation in Belgium (2010-2011)	Very difficult and chaotic	A few years
Education policy	Optimization of the student ability	Compatibility between the graduates and the professional requests

This last external influence introduces the main operational difference relatively to the recurrence procedures which are embedded in smooth spaces. To insert the effects of the disturbances in our forecasting algorithms, we have introduced the echoic horizons. These echoes produce deduced feedbacks from our best estimations to adjust the algorithm structures and our future understanding.
These echoes are the anti drift agents but they have to present the most likely evaluation. To try to approximate the echoes from the future, we may consider the past behaviours what is provided by past echoes. If the past evolution appears without any chaotic irregularity, it seems logical to extrapolate this way of progression to the future.
This view point proves the appreciable value of the recording of the sequences of past events or the statistical usefulness. Future always keeps a fraction of mystery and will never be absolutely known what brings to the anticipations an entropy level increasing with the distance between us and the first echoing horizon.
The anticipatory procedures have to move through space and time, consequently they are supported by travelling waves. This last consideration leads to their including in the set of convolution operators. But for anticipating the adapted convolutions are carriers of uncertainty and have to glide along trajectories with zigzags and sometimes branching points to different possible futures. The support of anticipations by the convolution operators contributes to a large extension of the usefulness of the moving operators. This also gives a common root to any mobile operation. This operational root is supplied by the $(\mathbf{ZO}_k)^p$ or the equivalent travelling wave.(Fig.20). By means of a short analogy it is possible to develop a bridge from the convolutions and the creation of our thoughts also based on hypotheses and deductions to improve our induced future.

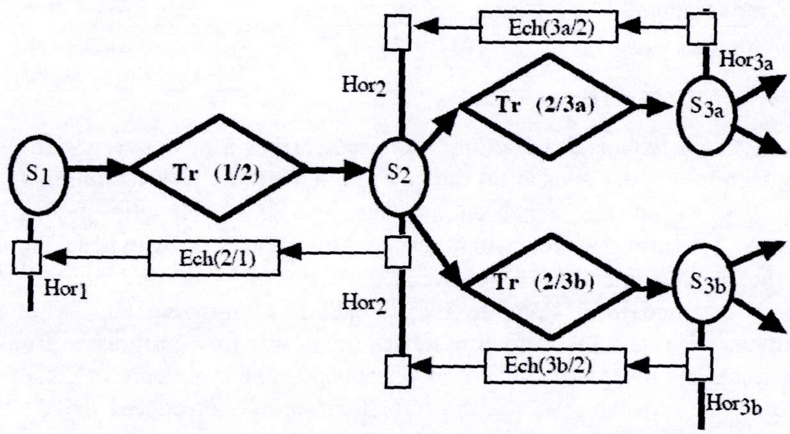


Fig. 20: Effects of echoic Horizons on an anticipatory Procedure

Here the target of our communication seems to be reached because waves related to the point behaviour are the quasi universal vehicles for every propagating information and transformation. Subsequently waves pull and push all progressive improvements in our world.

16 Electric Motors as stationary Converters

The most electric motors (= asynchronous motors) are composed of a stator connected to the electric power net for pumping electric energy and of a rotor which carries a mechanical shaft for transmitting the mechanical power. Stator and rotor produces each a rotating magnetic field and their interaction develops a mechanical force (= Laplace force). $\mathbf{F}_{Laplace} = K_{Lp}\, \mathbf{B}_{st}\, \mathbf{B}_{rt}$ (vector product) (10)
Where: K_{Lp} is the Laplace constant for extracting the mechanical effect from the magnetic fields, $\mathbf{B}_{st}$ & $\mathbf{B}_{rt}$: the rotating magnetic fields. (Fig. 21).

Table 10: Comparison between Recurrences and Anticipations

Specificities	Recurrences	Anticipations
Propagation spaces	Smooth	Corrugated
Kinds	Theoretic	In the Matter
Geodesics	Linear	Variable curvature
Branch points	Absent	Multiple sites on echoing horizons
Entropy	Uniform accuracy	Increasing entropy along the penetration in future
Information	Increases along the steps	Decreases along the horizons
Horizons	Without any echo	Echoic
Stabilizer	Not necessary	Echoic Feedback
Energy movements	Non Energetic transport	Progressive decreasing
Velocity	Constant velocity	Braking along the progression

By means of this mechanical attraction, the motor drives a power flow between stator and rotor which is keeping constant if the pair of magnetic fields are rotating at the same velocity (ω_{syn}), called the synchronous velocity. This magnetic device may be considered as 2 rotating waves which exchange a power flow whose amplitude is related to the angular interval ($\Delta\theta$) between these waves. The direction of the power conversion is oriented from stator to rotor if (**B**st) is following ($\mathbf{B}_{rt}$) what is motor function. Inversely, if (**B**rt) is following (**B**st), the power flow progresses from rotor to stator what gives the generator function. Consequently the main core of these machines acts as interaction between a wave , the rotor field, and a corrugated space : the stator field. The frequency of the rotor wave is identical to the folding of the stator field. It is a technologic illustration of a perfect frequency adjustment between the carrier space and its suited wave. We may consider that these both rotating fields perform a stationary dynamic evolution because they oscillate with a common frequency along a circular trajectory. (Fig.20) We let remark that the asynchronous machines are very frequently used and therefore we deduce that the frequency adaptations between waves and their carrier space find large application in the electromechanical conversions. The angular velocity of the rotor is: $\omega_{rt} = (1 - g)\, \omega_{syn}$ (11)

Where: g is the rotor slip which means the relative difference between ω_{syn} and w_{rt}:

$$g = (\omega_{syn} - \omega_{rt})/\omega_{syn} \quad (12)$$

for motor function: $0 < g < 1$ for generator function: $0 > g$

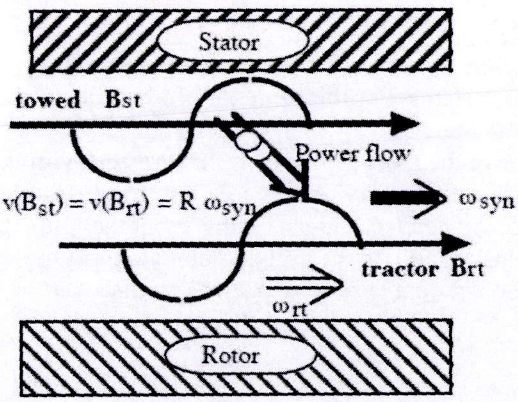


Fig. 21: Display of magnetic mechanical Conversion by means of a pair of magnetic Fields. Here Motor Function: **B**rt is Tractor & **B**st is towed

17 From the Thought Development to the Anticipatory Algorithms

When we analyze any new situation, we try to understand the causal mechanisms and to discover the main influencing factors. In the most occurrences, our mind extrapolates the present situation to forecast its likely evolution. Sometimes we search the best way to adjust the progression direction in conformity with our wishes. Indeed our mind continuously works to induce the best comfortable future which will bring us a lot of satisfactions and advantages. Therefore the anticipatory algorithms are the main elaborations of our mind because they help to improve our survival. The future attraction exerts a major influence over our present behaviour because any management needs forecasting. During the life we permanently try to develop bridges to the future because our present actions produce their results to adapt our future as we think it.

18 Geometry and Anticipation

18.1 Propagation Representation

The best way of understanding the propagations is to draw their progress in a space where time may be recorded. Consequently we obtain a good sight of these phenomena which reveals a lot of kinematic characteristics.

On another side, in paragraphs (5-6-14) was shown and explain the advantages of geometric frames for recording the evolutions.

18.2 Scaling Variation

As we have already explained, the geometry use allows easy condensations of whole space into a pulsating point equipped with every space characteristics. These procedures give a good detection of the far evolutions because it can play as local amplifier.

18.3 Geometric Future

As it was shown in the most paragraphs, geometry seems perform the best procedure to illustrate the evolution systems. For this target, it is advisable to project any evolution system on the kinematic State space which carries State and Time axes. (Fig. 22)
If it is possible to retrieve the most probable system trajectory from the information set which is related to this system behaviour , we shall introduce this evolution into the geometric universe, to win deeper understanding about the future transitions .
Indeed, what an easy task to follow the system point along its trajectory! On such a way we directly read the most probable state sequence and discover the possible stability domains where the system will be permanently enclosed

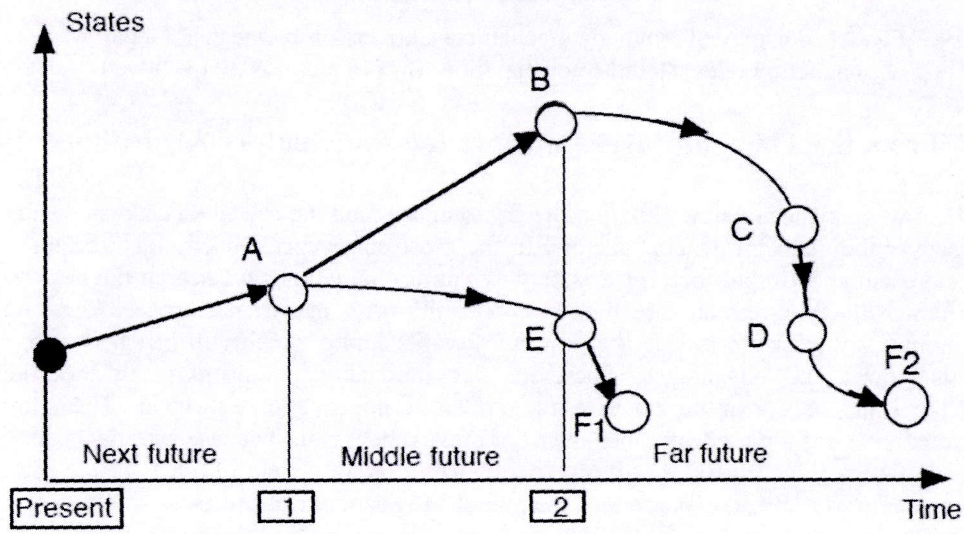


Fig. 22: Evolution in the State space (State – Time)
$Pr(A) > Pr(B) = Pr(E) > Pr(F_1) > Pr(C) > Pr(D) > Pr(F_2)$

The probability decreases along the time trajectory because the system states are located further and further in the future.
Each particular point is related to a specific probability of occurrence which informs about the future uncertainties
The best stability is produced by loop trajectories, which will be assimilated to ellipses whose characteristics are well known, what improves the system governing.

Indeed, geometry or kinematic configurations are effective to visualize the evolutions because the time introduction allows to approximate the specific system future.
On this way it is easy to follow the evolution through the (state-time) space.
The sorting of the probability levels would divide the future into 3 under domains, for simplifying the presentation. Briefly explained: (Fig.22)
-A next future associated to the super probabilities,
- A medium future linked with the middle probabilities,
- To terminate a far future for the weakest certainties.
It is obvious that these 3 levels of future correspond to an arbitrary choice, analogically deduced from the subdivision of the infra red and the ultra violet ranges in the spectra.
In particular cases it will be possible to increase the subdivision rate of these futures, if it is necessary.
Consequently geometric configurations are very flexible and useful to help the foresight of anticipatory procedures.

19 Conclusion

In this study was proved the equivalence between the pulsating points, the movement operators (**ZO**) and travelling waves. This viewpoint was obviously established by means of the Euler's relation where 2 orthogonal vibrations are the Cartesian components of a rotational displacement $(\mathbf{ZO}_\theta)^{k2\pi/N}$
Further, the insertion of Recurrences and Anticipatory procedures in the Convolution set displays a powerful synthesis of these various operators. From this assertion, we can deduce that the translator (**ZO**) is the common root of these operators.
Besides on higher level, it is also possible to connect the thoughts, the reasoning modulus, to the convolution operators. Indeed ideas are the dynamic actions of our mind. The need of movement operators was underlined because they support the essential convolutions through every domain. From this study the usefulness of the travelling waves as information vehicles is revealed. Besides they always follow the geodesics of their propagation space between each horizon pair.

References

[1] Atkins Peter – de Paula Julio (2002) Physical Chemistry, Oxford University

[2] Vanderbemden Philippe, (1999) Determination of Critical Current in Bulk High-Temperature Superconductors by Magnetic Flux Profile Measuring Methods, Université de Liège

[3] G.E. Hay (1957) Vector and Tensor Analysis, Dover Publications, Inc. New-York

[4] Doucet J. Alphonse (1998) Incursivity Operational Display, CASYS vol.1, CHAOS

[5] Polidoroff- Verlooy (1966) Géométrie Analytique, Wesmael- Charlier.

[6] Lupsin g. & Graas R. (1962) Géométrie Analytique plane, La Procure Bruxelles

[7] Massart J. (1975) Cours d'Analyse Mathématique: Calcul Différentiel, Edition Derouaux Liège.